

# Work Order ID 54504

December 10, 2009 11:52:03 AM



Page 1

Item ID: D212-664-101

Accept



Setup Start



Revision ID:

Stop



Item Name: Crosstube Fwd

Start Date: 10/12/2009 Start Qty: 1.00



Cust Item ID:

Required Date: 28/12/2009 Req'd Qty: 1.00

Customer:

Reference:

Run Start



Approvals:

Process Plan: *RP*

Date: *09/12/10*

Tooling:

Date:

Stop



QC:

Date:

SPC (Y/N):

Date:

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Draw  
Number

Draw  
Rev.

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

Draw Nbr

Revision Nbr

D212-664-141

Rev D

100

0.00



DOCUMENT CONTROL

DC

Memo

0.00

Document Control

Photocopy bluefile and create labels as per PPP D212-664-101 CHG003

*E. Colablos*

*10-1-8 10/01/07*

110

0.00



Pick Kit

Packaging

Packaging

Memo

0.00

Packaging

*10-1-8 10 SP*

120

0.00



BENDING MACHINE - CROSSTUBES

CNC Bend 2

Memo

0.00

CNC Alpha 160 Bender

Bend tube as per Dwg D212-664-141 using CNC bender program 212-fw and Folio FT015

*14 11/09-12-16*

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

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Customer:

Reference:

Run Start



Approvals:

Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Stop



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run HoursDraw  
NumberDraw  
Rev.Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

130

QC15- Crosstube Dimensional Check

0.00



QC

Memo

0.00

Quality Control

CP 09.12.16

140

Crosstubes

0.00



Crosstubes

Memo

0.00

Crosstubes

1-Drill pilot holes in tube as per Dwg D212-664-141 using drill Jig DT8548 &amp; DT8549

2-Ream hole to finish size in tube as per Dwg D212-664-141 using drill Jig DT8548 &amp; DT8549. Check dimensions between holes, both sides on both cuffs, to ensure alignment with saddle holes.

3-Scribe part # and batch # using vibrating stylus as per Dwg D212-664-141

4-Deburr &amp; Inspect for surface damage. Repair damage within limits as per Dwg D212-664-141

MS/SAD  
09-12-17

- AWM 9-12-09

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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**Work Order ID 54504**

December 10, 2009 11:52:04 AM



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Customer:

Reference:

Run Start



Approvals:

Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Stop



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run HoursDraw  
NumberDraw  
Rev.Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

150

Crosstubes Chemical Conversion

0.00



HandFXtube

Memo

0.00

Hand Finishing Crosstubes

Chemical Conversion Coat within 24 hours of bending and drilling

1 - - - - - 10/12/09

160

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

1 - - - - - 10/12/09

170

Outsource process - NDT per QSI038 4.1

0.00



Outsource2

Memo

0.00

Outsource process - NDT

Liquid Penetrant Inspection as per QSI 038  
Issue P/O: 11012  
LPI as per ASTM 1417 Level 2  
Attach copy of NDT results to work order

C2 10/10/09 ①

W/O:		WORK ORDER CHANGES					
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Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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**Work Order ID 54504**

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December 10, 2009 11:52:04 AM

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Start Date:	10/12/2009	Start Qty: 1.00				
Required Date:	28/12/2009	Req'd Qty: 1.00				
Reference:						

Approvals:	Process Plan: _____	Date: _____	Tooling: _____	Date: _____
	QC: _____	Date: _____	SPC (Y/N): _____	Date: _____

Run	Start	
	Stop	

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
180 	Receive & Inspect for Damage & Mat'l Certs	0.00							
Packaging									
Packaging	Memo	0.00							
	Ensure copy of NDT results attached to work order.								
190 	QC5- Inspect part completeness to step on W/O	0.00							
QC									
Quality Control	Memo	0.00							
	Inspect for damage & ensure results are as per Dwg D212-664-141								

*PL 90/01/04 ①*

*10 01 04 ①*

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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# Work Order ID 54504

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Item Name:	Crosstube Fwd					
Start Date:	10/12/2009	Start Qty: 1.00		Cust Item ID:		
Required Date:	28/12/2009	Req'd Qty: 1.00		Customer:		
Reference:						

Approvals:	Process Plan: _____	Date: _____	Tooling: _____	Date: _____	Run	Start	
	QC: _____	Date: _____	SPC (Y/N): _____	Date: _____		Stop	

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
200	Spray Painting per QSI005 4.2	0.00							
	SprayPaint								
Spray Painting	Memo	0.00							
	1-Prime inside and outside crosstube as per QSI 005 4.2								
	2-Paint outside crosstube with White Imron as per QSI 005 4.2								
	PRIME:								
	Start Time: <u>8:30</u>								
	Finish Time: <u>9:30</u>								
	PAINT:								
	Start Time: <u>2:30</u>								
	Finish Time: <u>3:30</u>								
210	QC14- Inspect Spray Paint	0.00							
	QC								
Quality Control	Memo	0.00							
	Then, Wrap in plastic bag to protect from scratches								

10 01 05-0

10-01-06

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_








Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_




NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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**Abstract**

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Start Date:	10/12/2009	Start Qty: 1.00		Cust Item ID:		
Required Date:	28/12/2009	Req'd Qty: 1.00		Customer:		
Reference:						
Approvals:	Process Plan: _____	Date: _____	Tooling: _____	Date: _____	Run	Start 
	QC: _____	Date: _____	SPC (Y/N): _____	Date: _____		Stop 

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
220  Crosstubes Crosstubes	Crosstubes  Memo 1- Lightly scuff the bonded area using a 320 grit sand paper and clean the area with 41058 wash 'n' wipe 2-Install supports with magnobond as per QSI 015 Adhere for 12 Hrs A/R 6398 Magnobond Batch: <u>112417 exp 01/2011</u> <u>Torque: ml 10/01/07 ①</u>	0.00  0.00				<u>ml</u>	<u>10</u>	<u>01</u>	<u>06 ①</u>
230  QC Quality Control	QC5- Inspect part completeness to step on W/O  Memo	0.00  0.00					<u>①</u>		<u>2) S 10/01/07</u>
240  Packaging Packaging	Pick Kit  Memo	0.00  0.00					<u>10-18</u>	<u>②</u>	<u>S</u>

W/O:		WORK ORDER CHANGES					
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Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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Stop



Item Name: Crosstube Fwd

Start Date: 10/12/2009 Start Qty: 1.00



Cust Item ID:

Required Date: 28/12/2009 Req'd Qty: 1.00



Customer:

Reference:

Run Start



Approvals:

Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Stop



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run HoursDraw  
NumberDraw  
Rev.Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

250

QC4- 100% Inspect kits for completeness

0.00



QC

Memo

0.00

&gt; 8 10/10/09



Quality Control

260

Packaging

0.00



Packaging

Memo

0.00

Identify and pack for shipping as per PPP D212-664-101

N.V. K

P 10/11/08 (2)

270

QC21- Final Inspection - Work Order Release

0.00



QC

Memo

0.00

Quality Control

10/01/11

BS 10-1-08  
(1)

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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NOTE: Date & initial all entries

# Picklist Print

December 10, 2009 11:52:07 AM

Page 1

Work Order ID: 54504

Parent Item: D212-664-101

Parent Item Name: Crosstube Fwd

Comments: IPP RevH: as per ECN09-696 09.11.19 DD verified by:EC

Start Date: 10/12/2009

Required Date: 28/12/2009

Start Qty: 1.00

Required Qty: 1.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
---------------------------------	------------------------	---------------	-------------	---------------------	------------------	-----------------	--------------------	----------------	--------------------------	---------------	----------------	--------

D212-664-101 TRN Manufactured No

110

Each

3.0000

1.0000



Crosstube Turning Detail

B-54409 MB 09-12-16

## Warehouse

## Loc Qty

## Loc Code

### Location

Main Warehouse

FG

3

53256

1

54281

1

54284

1

D3595-063-450 Manufactured No

230

Each

188.9689

4.2105



RUBBER CUSHION

## Warehouse

## Loc Qty

## Loc Code

### Location

Main Warehouse

LG

84

52447

84

Main Warehouse

ST

104.9689

38959

2

43210

2.59

46465

0.3789

53775

100

m/l 10/01/06

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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Required Date: 28/12/2009

Comments: IPP RevH: as per ECN09-696 09.11.19 DD verified by:EC

Start Qty: 1.00

Required Qty: 1.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
MS21920-25		Purchased	No			220	Each	201.0000	4.0000			

Clamp(per MIL-DTL-8783C)

<u>Warehouse</u>	<u>Loc Qty</u>	<u>Loc Code</u>
<u>Location</u>		
Main Warehouse		
ST	201	
107456	2	
108111	3	
108975	17	
109181	42	
109644	10	
111282	4	
111429	1	
<u>112495</u>	22	
112919	25	
113281	25	
113282	50	

*ml 10/01/06*

W/O:		WORK ORDER CHANGES					
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---------------------------------	------------------------	---------------	-------------	---------------------	------------------	-----------------	--------------------	----------------	--------------------------	---------------	----------------	--------

D2893-1

Manufactured

No

220

Each

71.0000

2.0000



2.75 Support

Warehouse

Loc Qty

Loc Code

Location

Main Warehouse

ST

71

25657

6

47109

2

47637

15

51775

19

53125

19

53340

10

ml 10/01/06

D3428-1

Manufactured

No

240

Each

11.0000

1.0000



Placard

10-1-8 DS

Warehouse

Loc Qty

Loc Code

Location

Main Warehouse

ST096

11

50790

11

/

W/O:		WORK ORDER CHANGES					
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---------------------	------------------	---------------------	------------	----------	------------------	---------------	--------------	-----------------	-------------	-----------------------	------------	-------------	--------

AN6-35A			Purchased	No			240	Each	58.0000	4.0000			
<div style="display: flex; justify-content: space-between;"> <div> <p>BOLT</p> </div> <div> <p>Warehouse Location</p> <p>Main Warehouse</p> <p>ST</p> <p>112314</p> <p>112805</p> </div> <div> <p>Loc Qty</p> <p>58</p> <p>38</p> <p>20</p> </div> <div> <p>Loc Code</p> <p></p> </div> </div>													

AN6-36A			Purchased	No			240	Each	123.0000	4.0000			
<div style="display: flex; justify-content: space-between;"> <div> <p>Bolt</p> </div> <div> <p>Warehouse Location</p> <p>Main Warehouse</p> <p>ST</p> <p>109632</p> <p>110382</p> <p>112314</p> <p>113121</p> </div> <div> <p>Loc Qty</p> <p>123</p> <p>1</p> <p>2</p> <p>70</p> <p>50</p> </div> <div> <p>Loc Code</p> <p></p> </div> </div>													

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MS21042L6

Purchased

No

240

Each

500.0000

6.0000



10-1-8

sf

Nut

Warehouse

Loc Qty

Loc Code

Location

Main Warehouse

ST

500

105077

22

110002

5

111548

8

111578

400

112492

65

AN960JD616

Purchased

No

240

Each

787.0000

18.0000



10-1-8

sf

Washer

Warehouse

Loc Qty

Loc Code

Location

Main Warehouse

ST

787

112314

3

112828

484

113149

300

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

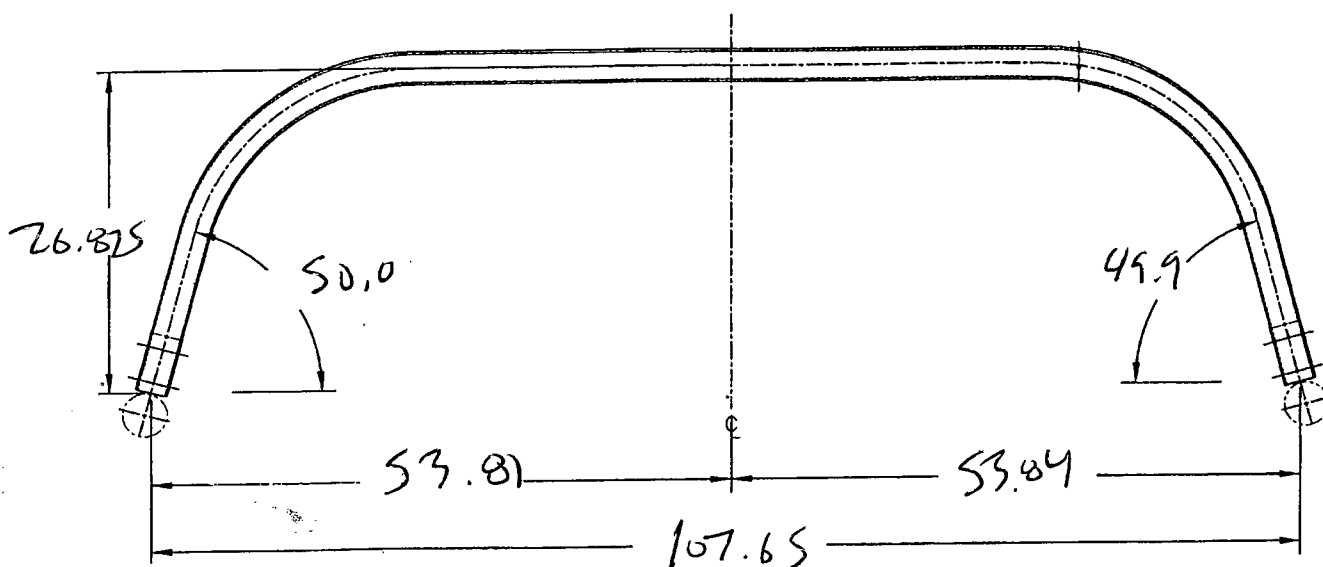
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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



DART AEROSPACE LTD		Work Order:	54504
Description: Crosstube High Fwd (205/212/412)		Part Number:	D212-664-101
Inspection Dwg: D212-664-141 Rev: C		Page 1 of 1	

Required Dimension	Min	Max
Height	26.79	27.05
1/2 Span	53.59	53.85
Angle	49	52
Total Span	107.18	107.7



Comments
20.1" cut from bottom of tube to RMV heavy chamber. Dims represent cut dims. Cut at indicated height.
4/09.12.16

QC15 Inspection	
Date	09.12.16

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	07.05.31	Dimensions updated per Dwg Rev C	KJ/JM	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

D

Item	Qty -141	Qty -141B	Part Number	Description
1	X		D212-664-141	CROSSTUBE ASSEMBLY (205/212/412 HIGH FWD)
2		X	D212-664-141B	CROSSTUBE ASSEMBLY (214 HIGH FWD)
3	1	1	D6005-128	CROSSTUBE
4	2	2	D2893-1	SUPPORT
5	4	4	D3595-063-450	RUBBER CUSHION
6	4	4	MS21920-25	CLAMP (OR MS21920-26)
7	A/R	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

# GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6005-128  
FINISHED LENGTH = 126.514±0.020
- FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: SCRIBE DART PART NUMBER "D212-664-XXX" AND BATCH NUMBER ON INSIDE OF CUFF  
USING VIBRATING STYLUS
- WEIGHT: D212-664-141 = 33.6 lbs (PER IIN-D212-664)  
D212-664-141B = 33.6 lbs (PER IIN-D212-664)
- PART IS SYMMETRIC ABOUT CENTERLINE.
- RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- BEND/PROGRESSIVELY WITH A MINIMUM OF 3 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS  
6% BASED ON O.D.
- LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- INSTALL D2893-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 TO THE SURFACE OF  
D2893-1 THAT WILL BE IN CONTACT WITH THE CROSSTUBE PER QSI 015. LET CURE FOR 12 HOURS AFTER  
INSTALLATION AND PRIOR TO PACKAGING.
- INSTALL MS21920-25 CLAMPS (OR -26) WITH D3595-063-450 RUBBER CUSHIONS TO SECURE THE D2893-1  
SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE  
SUPPORT.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE  
SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR  
DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND  
MARKS ARE UNACCEPTABLE.
- TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT  
HAS NOT BOTTOMED-OUT AFTER TORQUING.

SHOP COPY  
RETURN TO  
ENGINEERING  
UNCONTROLLED COPY  
SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER

NO. 54504  
PL 09-12-10

RELEASED  
2009-10-29  
MM

D	REFORMAT/REVISE GENERAL NOTES/PART LIST; REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS; ADD -141B (ZN B4-2, D4-2); REMOVED REF & ADD TOLERANCES (ZN B4-3, C6-3, C8-3 & B6-3); RELOCATED FLAG #6 PER PAR 08-046 (ZN A5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4	RF	09.09.30
C	REMOVE -851 ABRASION STRIP; ADD MAGNOBOND 6398, CUSHION, REVERSE CLAMPS	PH	07.03.08
B	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	PH	05.02.04
A	NEW ISSUE	PH	00.12.12
REV.	DESCRIPTION	BY	DATE
DESIGN	PH	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	RF		
CHECKED	PH	DRAWING NO.	REV. D
MFG. APPR.	PH	D212-664-141	SHEET 1 OF 4
APPROVED	PH	TITLE	SCALE
DE APPR.	PH	XTUBE ASS'Y (205/212/412 HI FWD)	NTS
DATE	09.09.30	COPYRIGHT © 2000 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	

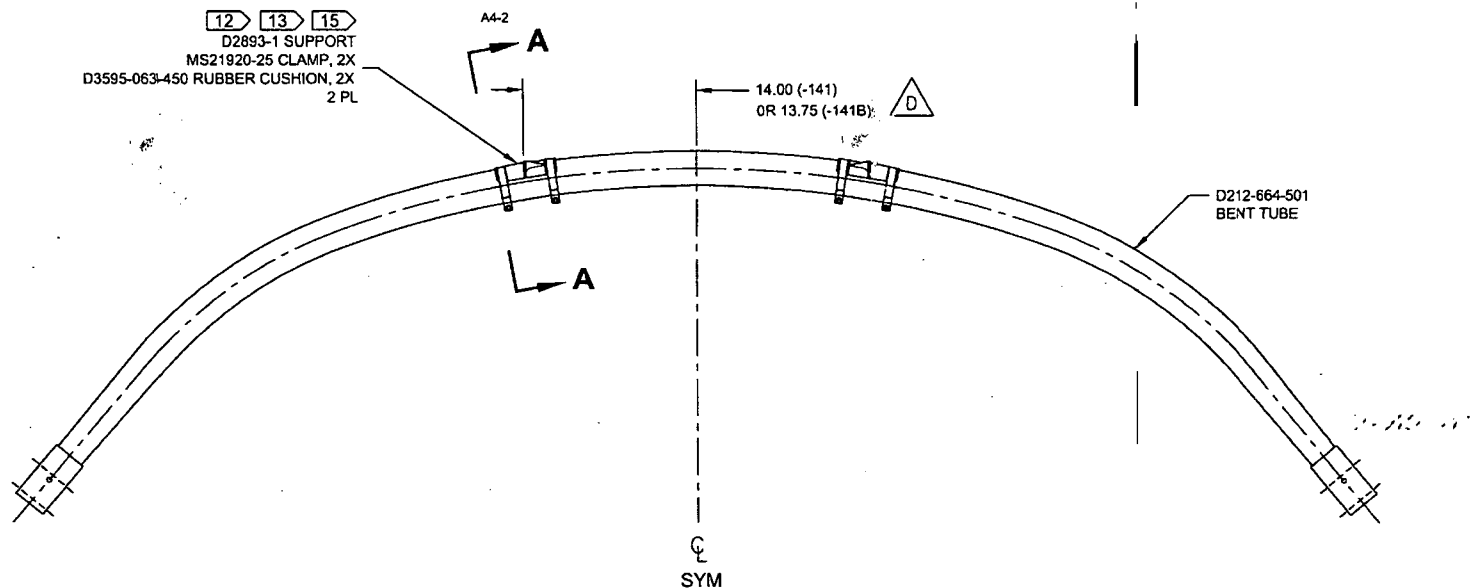
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

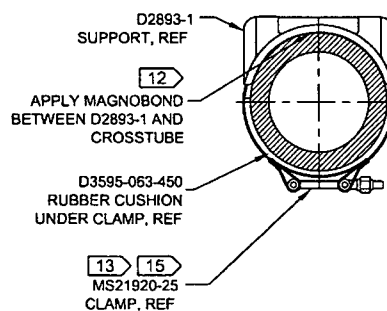
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



**D212-664-141/-141B  
ASSEMBLY DETAIL**



**SECTION A-A** D5-2  
SCALE 4X

**RELEASED**  
2009-10-29

DESIGN	PH	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
DRAWN	RF		
CHECKED	QP	DRAWING NO.	REV. D
MFG. APPR.	DS	D212-664-141	SHEET 2 OF 4
APPROVED	142	TITLE	SCALE
DE APPR.	14	XTUBE ASS'Y (205/212/412 HI FWD)	NTS
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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

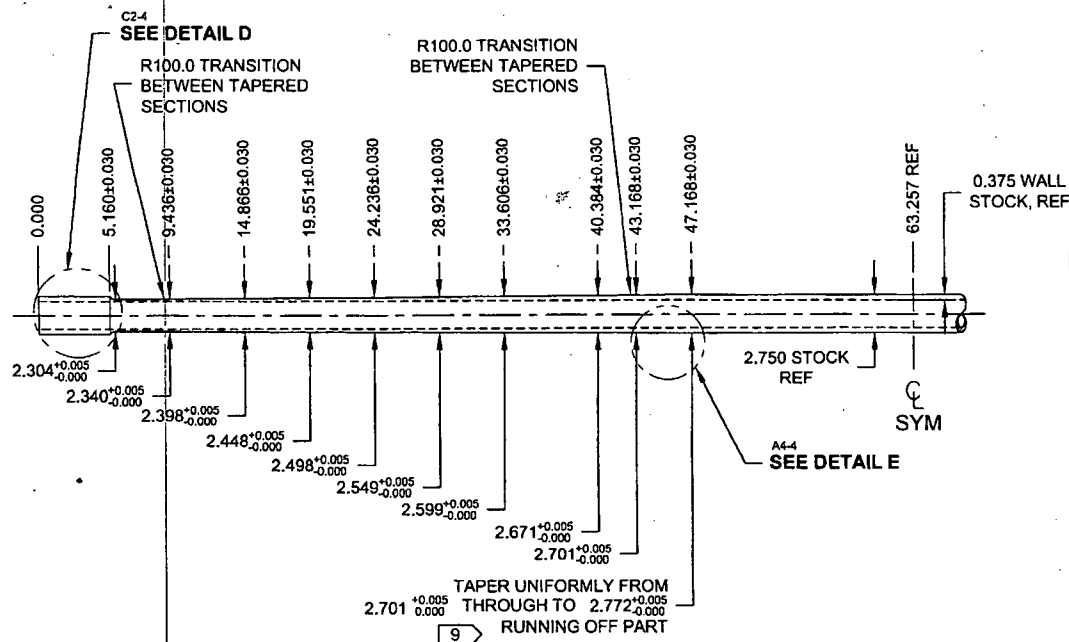
Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

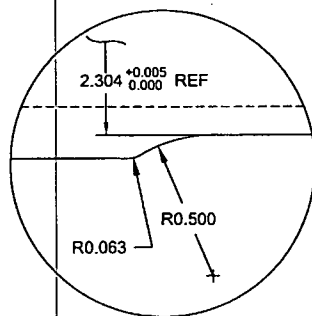
NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

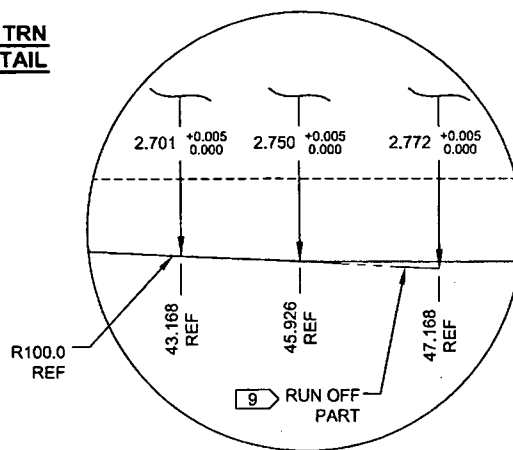




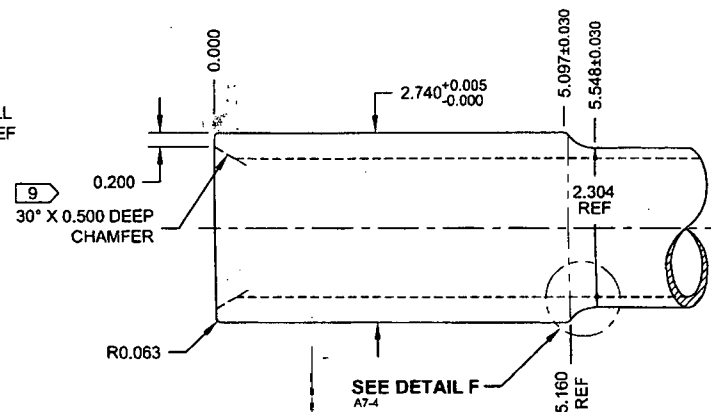
**D212-664-141TRN  
TURNING DETAIL**



**DETAIL F:  
CUFF TRANSITION** C2-4  
SCALE 10X



**DETAIL E:  
TAPER RUN-OFF** C5-4  
NOT TO SCALE



**DETAIL D:  
CROSSTUBE CUFF** D8-4  
SCALE 5X

**RELEASED**  
2009-10-29

W10 54504

DESIGN	PH	<b>DART AEROSPACE LTD</b>	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	98	DRAWING NO.	REV. D
MFG. APPR.	10	D212-664-141	SHEET 4 OF 4
APPROVED	10	TITLE	SCALE
DE APPR.	10	XTUBE ASS'Y (205/212/412 HI FWD)	NTS
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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

## 5.0 PARTS LIST

## 5.1 HIGH GEAR CROSSTUBES

Item	-101	-201	-203	Part Number	Description
	X			D212-664-101	CROSSTUBE INSTALLATION, 204/205/210/212/214/412, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH FWD
		X		D212-664-201	CROSSTUBE INSTALLATION, 204/205/210/212/214, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH AFT
			X	D412-664-203	CROSSTUBE INSTALLATION, 412 HIGH AFT
1	1			D212-664-141	CROSSTUBE ASSEMBLY, 204/205/210/212/214/412, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH FWD
2		1		D212-664-241	CROSSTUBE ASSEMBLY, 204/205/210/212/214, UH-1H, UH-1A/B/E/F/L/P, TH-1F/L, HH-1K HIGH AFT
3			1	D412-664-243	CROSSTUBE ASSEMBLY, 412 HIGH AFT
10	2			* D2893-1	SUPPORT
11	4			* D3595-063-450	RUBBER CUSHION
12	4			* MS21920-25	CLAMP (OR MS21042-26)
13	4			AN6-35A	BOLT
14	4			AN6-36A	BOLT
15	6			MS21042L6	NUT (OR MS21042-6)
16	18			AN960JD616	WASHER
20		2		* D2940-1	SUPPORT
21		4		* D3595-063-530	RUBBER CUSHION
22		4		* MS21920-28	CLAMP (OR MS21042-30)
23		4		AN6-40A	BOLT
24		2		AN6-41A	BOLT
25		6		MS21042L6	NUT (OR MS21042-6)
26		18		AN960JD616	WASHER
30			1	* D2896-1	SUPPORT
31			2	* D2856-600-1009	ABRASION STRIP
32			2	* D3595-063-570	RUBBER CUSHION
33			4	* MS21920-28	CLAMP
34			2	* MS21920-30	CLAMP (OR MS21042-32)
35			4	AN6-40A	BOLT
36			2	AN6-41A	BOLT
37			6	MS21042L6	NUT (OR MS21042-6)
38			18	AN960JD616	WASHER
39			2	* D3189-1	CHAFING SHIELD
50	1	1		D3428-1	PLACARD

\*REFERENCE ONLY. PARTS ARE INCLUDED IN D212-664-141/-241 OR D412-664-243 ASSEMBLIES ABOVE  
NOTE: KITS INCLUDE EXTRA HARDWARE FOR COMPATIBILITY WITH BOTH DART AND BELL/AA  
SKIDTUBES.

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Revision: F  
Date: 08.09.05

## Chris Provencal

---

**From:** David Shepherd [dshepherd@dartaero.com]

**Sent:** December 15, 2009 3:04 PM

**To:** 'Chris Provencal'

**Subject:** RE: Xtube with ridges

Chris,

As you suggest, bending the tube slightly overheight and trimming off the ends is probably the best solution.

David

---

**From:** Chris Provencal [mailto:cprovencal@dartaero.com]

**Sent:** Monday, December 14, 2009 2:24 PM

**To:** 'David Shepherd'

**Subject:** Xtube with ridges

David,

Sorting out some conflicting info... the tube with the ridges at the end of the cuffs is actually a 212 fwd (I verified the ID). I attached a sketch showing what it would look like with the holes (0.386 OD). I think that if we ensure the holes are drilled at max dim, it's not that bad structurally considering it only bears on that edge in the air. The only thing is that it just looks wrong to have a hole that close to a ridge.

Alternately I could also tell them to try to bend it a bit high, and then cut off about 0.06"-0.10" before drilling the holes.

-Chris

No virus found in this incoming message.

Checked by AVG - [www.avg.com](http://www.avg.com)

Version: 8.5.427 / Virus Database: 270.14.105/2562 - Release Date: 12/13/09 07:39:00





## LIQUID PENETRANT TEST REPORT

P- 1531

PAGE 1 OF 1

CLIENT	DART Aerospace	DATE	DEC 28-2003	TIME	AM	P
ATTENTION	LINDA / KANTAL	ACUREN JOB NO.	188-09-001085			
ADDRESS	1270 ABERDEEN ST	PO/VO NO.	11012			
	HAWKESBURY ON.	WORK LOCATION	SAME			
	KOH IK7	ACCEPTANCE STD.	ASTM 1417	REV./DATE	200	
PROJECT	F.P.I. ON CROSS TUBES AND MACHINED PARTS					
ITEM(S) EXAMINED	4 CROSS TUBES					
	11 MACHINED - STUDS. 2 COLLECTIVE BELL CRANK W.O. 53					
JOB DESCRIPTION	PROCEDURE NO. LT0002 REV./DATE		TECHNIQUE NO. LT0002 REV./DATE			
PART NO.	- S/STEEL -		MATERIAL		ALUMINUM THICKNESS - 1/4"	
SCOPE	WET FLUORESCENT LIQUID PENETRANT					
	INSPECTION CARRIED OUT WITH EXTERNAL					

TEST DETAILS	
METHOD	<input checked="" type="checkbox"/> FLUORESCENT <input type="checkbox"/> VISIBLE
FAMILY BRAND	MAGNAFLUX
PENETRANT	2467 MINIMUM DWELL TIME 45 MIN.
PENETRANT REMOVER	H-20 MINIMUM DRY TIME >10 MIN.
DEVELOPER	SKD 52 MINIMUM DWELL TIME 10 MIN.
DEVELOPER TYPE	<input checked="" type="checkbox"/> NON AQUEOUS <input type="checkbox"/> AQUEOUS <input type="checkbox"/> DRY
<input checked="" type="checkbox"/> WATER WASH 16454 <input type="checkbox"/> SOLVENT REMOVABLE <input type="checkbox"/> POST EMUL	
BLACK LIGHT S/N 4 <input type="checkbox"/> OUTPUT > 1000 µW/CM² <input type="checkbox"/> AMBIENT <	
LIGHTING EQUIP. <input type="checkbox"/> FLASHLIGHT <input type="checkbox"/> TROUBLELIGHT <input type="checkbox"/> OUTPUT > 100 fc @ 5	
OTHER LASER	
LIGHT METER S/N 1098866 CAL DUE DATE 12-1	

TEST SURFACE	
SURFACE CONDITION	<input type="checkbox"/> AS GROUND <input type="checkbox"/> AS WELDED <input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> SHOT BLASTED <input type="checkbox"/> CLEAN BARE ME
SURFACE TEMPERATURE	<input type="checkbox"/> < -4°C/ 20°F <input type="checkbox"/> -4°C/ 20°F TO 10°C/ 50°F <input checked="" type="checkbox"/> 10°C/ 50°F TO 52°C/ 125°F <input type="checkbox"/> > 52°C/ 125°F
RESULTS-	<input type="checkbox"/> METRIC <input checked="" type="checkbox"/> IMPERIAL

1 CROSS TUBE - W.O. 53341	✓
1 CROSS TUBE - W.O. 53342	✓
1 CROSS TUBE - W.O. 54504	✓
1 CROSS TUBE - W.O. 54503	✓
11 STUDS - W.O. 50932	✓
2 COLLECTIVE BELL CRANK	✓
W.O. 53635	

M 10 01 04

**Scope of Services**  
The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressed that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as well as data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

**Standard of Care**  
In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES	
CLIENT REPRESENTATIVE	DTR # E-27641
TECHNICIAN (SIGNATURE):	REPORT REVIEWED BY:
NAME (PRINT):	NAME INIT
1 <sup>ST</sup> TECHNICIAN	2 <sup>ND</sup> TECHNICIAN
CGSB LEVEL	CGSB LEVEL
SNT LEVEL	SNT LEVEL
CGSB REG. NO.	CGSB REG. NO.

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PT: